

EX/PRN/MATH/ T/121/2017

B.PRINTING ENGG. Examination, 2017
(1ST YR, 2ND SEM)
MATHEMATICS
PAPER - II R

Full Marks : 100

Time: Three hours

Answer question one and any six questions.

$$4 + 16 \times 6 = 100$$

1 Find the square root of $1 - i\sqrt{x^4 - 1}$ (4)

2 (a) State and prove De Moivre's theorem. (8+8)
(b) Express $\tan 5\theta$ in terms of $\tan \theta$.

3. (a) Expand by Laplace's method to prove that

$$\begin{vmatrix} a & -b & -a & b \\ b & a & -b & -a \\ c & -d & c & -d \\ d & c & d & c \end{vmatrix} = 4(a^2 + b^2)(c^2 + d^2).$$

(b) Solve by Cramer's rule

$$ax + by + cz = 2, \quad cx + ay + bz = 0, \quad bx + cy + az = 0$$

(8+8)

- 4 (a). Find the analytic function $f(z) = u + iv$ of which the real part is (8+8)

$$u = x^3 - 2xy - 3xy^2.$$

- (b) Find the Laurent's series

$$f(z) = \frac{1}{z^2(z-1)}$$

for

$$(i) 0 < |z| < 1 \quad (ii) |z| > 1 \quad (iii) |z-1| > 1.$$

- 5 (a) Find the inverse of the matrix where (8+8)

$$A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \\ 3 & 1 & 2 \end{bmatrix}$$

- (b) Find the eigen values and eigen vectors of

$$A = \begin{bmatrix} 1 & -6 & -4 \\ 0 & 4 & 2 \\ 0 & -6 & -3 \end{bmatrix}$$

6. (a). Find the equation of the plane through the points $(1, 0, -1)$ and $(3, 2, 2)$ and parallel to the straight line (8+8)

$$\frac{x-1}{1} = \frac{1-y}{2} = \frac{z-2}{3}.$$

- (b) Find the equation of tangent and normal to the curve

$$(ax)^2 + (by)^2 = 1, \text{ at } (1, 1).$$

7. (a) Find the shortest distance between the lines (8+8)

$$\frac{x-1}{1} = \frac{y-2}{-1} = \frac{z-1}{1} \quad \text{and} \quad \frac{x-2}{2} = \frac{y+1}{1} = \frac{z+1}{2}.$$

(b) The probability of detecting a tuberculosis in X-ray examination of a person suffering from a disease is $1 - b$. The probability of diagnosing a healthy person as tuberculosis is a . If the ratio of tubercular patients to the whole population is c , find the probability that a person is healthy if after the examination he is diagnosed as tubercular.

8. (a) Prove that

(5+5+6)

$$P(A \cup B) = P(A) + P(B) - P(A \cap B).$$

(b) If $\{A_n\}$ be a monotonic sequence of events, prove that

$$P(\lim_{n \rightarrow \infty} A_n) = \lim_{n \rightarrow \infty} P(A_n).$$

(c) A and B are two independent witnesses in a case. The probability that A will speak the truth is x and the probability that B will speak the truth is y . A and B will agree in a certain statement. Show that the probability that this statement is true is

$$\frac{xy}{1 - x - y + 2xy}.$$